REMARKS

The Office Action includes the following six prior art rejections:

(1) Claims 1-14 for anticipation under 35 U.S.C. §102(b) or obviousness under 35 U.S.C. §103(a) over JP 11-021,197;

(2) Claims 1, 3, 5 and 10 for obviousness under 35 U.S.C. §103(a) over U.S. Patent Publication No. 2004/0099205 to Li et al. in view of asserted admitted prior art and JP 2000-272,990;

(3) Claims 1, 4, 5 and 11 under 35 U.S.C. §103(a) for obviousness over U.S. Patent No. 6,332,922 to Sakuma et al. or U.S. Patent No. 6,673,150 to Garibin et al., either one in view of the asserted admitted prior art and JP '990; and

(4) Claims 1-14 under 35 U.S.C. §103(a) for obviousness over the Li patent in view of the asserted admitted prior art, JP '990 and JP '197.

Applicants respectfully traverse these rejections for the following reasons.

Claim 1 has been amended to clarify that the claimed crystal is not annealed. A crystal produced by a single crystal pulling method and having the dimensions and properties set forth in claim 1, where the crystal is not annealed to achieve these properties, is not taught or suggested by the prior art of record.

Claim 1 is directed to a crystal that is produced by a single crystal pulling method and that is not further treated by annealing. By "as-grown", it is meant the state of the crystal after its production without such further treatment. Applicants have discovered certain alkaline earth metal single crystals having a crystal with a length of at least 17 cm and light transmittance of at least 80% at 632.8 nm can be produced via single crystal pulling. However, as demonstrated on the record, and by the Declaration Under 37 CFR §1.132 submitted September 29, 2005, not all single crystal pulling systems result in a crystal having the claimed properties, particularly the claimed light transmittance at 632.8 nm.

The crystal pulling device disclosed in JP '197 lacks a structure to control cooling of the melt such as a barrier between the melting heater and the crucible. The §1.132 Declaration demonstrates that without a structure for controlling cooling, high light transmittance cannot be achieved even using a crystal pulling method. Instead, as noted in the January 3, 2006 Office Action, the product of JP '197 is annealed. Such annealing

improves light transmittance. Claim 1 requires that the crystal of the present invention having the claimed properties is not annealed. The §1.132 Declaration submitted September 29, 2005 demonstrated that because a system similar to that disclosed in JP '197 does not produce crystals with the claimed high light transmittance, that not all single crystal pulling methods results in a crystal having the high transmittance required by claim 1. The product produced by JP '197 does not anticipate the present invention since the product produced according to JP '197 does not achieve the properties required by claim 1. To the extent that the final product of JP '197 has a crystal which is subjected to annealing steps, the present invention is distinct therefrom as being a final product that does not require annealing.

Applicants have developed and claimed a crystal that is produced by a single crystal pulling method which is not annealed yet has a unique set of properties, including a straight barrel length of not less than 17cm and a light transmittance of not less than 80% measured at a wavelength of 632.8nm. Accordingly, claims 1-14 are not taught by JP '197.

Additionally, claims 1-14 are not suggested by JP '197. The product of JP '197 would require annealing to increase light transmittance. Nothing in JP '197 would suggest that a non-annealed crystal having the claimed high light transmittance could be produced. As such, the claimed crystal structure is distinct from that produced according to JP '197, and claims 1-14 define thereover.

In the rejection of claims 1, 3, 5 and 10 over the Li patent in view of asserted admitted prior art and JP '990, the Examiner has relied on the explanation in the present application that crystals produced in a crucible depression method (such as in the Li patent) have an opaque peripheral surface. The new reference of JP '990 is cited for teaching a lined crucible that produces high purity crystals. Prior crucibles are known to generate carbon powder, which contaminates the crystal. The crucible liner of JP '990 instead is composed of a glassy carbon layer deposited by pyrolysis onto the crucible inner surface. This carbon liner is designed to prevent cracking of the crucible and contamination from the crystal grown therein. However, the Office Action goes beyond what is actually taught in JP '990 and argues that a crucible which does not contaminate growing crystals would result in crystals that "inherently have high light transmittance at 632.8 nm wavelength". There is no support for this assertion. The crucible of JP '990 prevents contamination of a crystal with carbon powder. Nothing in JP '990 considers how this freedom from contamination affects light

transmittance, despite the Examiner's assertion that the absence of surface polycrystals would inherently improve light transmittance.

The absence of contamination of the crystal is a distinct property from the high light transmittance achieved according to the present invention. JP '990 itself does not describe, or even suggest, that a crystal grown in the disclosed crucible would have superior visible light transmittance as required by the present claims. Moreover, a smooth lined crucible according to JP '990 would still have a problem of opacity encountered by producing crystals in a crucible. The inner wall of the crucible still contacts the peripheral surface of the starting material melt. This contact with the crucible wall during crystal growth restricts the crystal surfaces. A crystal grown according to the crucible depression method cannot achieve the superior visible light transmittance of the present invention because it has peripheral restriction on the surfaces of the growing crystal, despite having a smooth surface as in JP '990.

In contrast, a single crystal pulling method produces a crystal without this peripheral restriction on the surfaces of the crystal and solves the problem of opacity commonly occurring in crystals produced according to crucible depression methods. Accordingly, even if the teachings of JP '990 were included with those of the Li patent or the disclosure in the present invention concerning a crucible depression methods, the resulting crystal would still have an opaque peripheral surface, and a crystal as defined by claim 1 could not be produced. There is no suggestion in any of the cited references that such a crystal having a claimed high light transmittance could be produced. Accordingly, claims 1, 3, 5 and 10 define over the cited references.

Similarly, claims 1, 4, 5 and 11 define over the combination of the Sakuma or Garibin patents in view of the admitted art and JP '990 for the same reasons. The Sakuma and Garibin patents also only disclose a crucible depression method, which has the well-established problem of crystal opacity. The teachings of JP '990 would not overcome this problem, nor is there any motivation provided in any of these references to produce a crystal as claimed in claim 1.

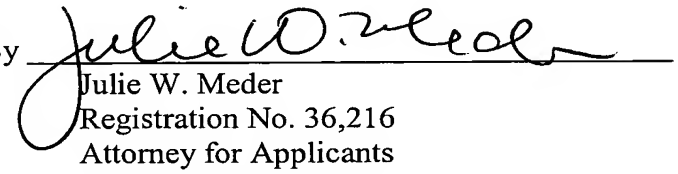
Finally, the obviousness rejection of claims 1-14 over the Li patent in view of the admitted art, JP '990 and JP '197 fails for the same reasons. JP '990 does not supplement the deficiencies of the Li patent in its teachings to produce a crystal according to a crucible

depression method. The teachings of JP '990, even if combined with the Li patent, would not produce a crystal having light transmittance as required by claim 1. Additionally, as established on the record, the method of JP '197 likewise cannot produce a crystal as required in claim 1 in a non-annealed state.

Accordingly, claims 1-14 define over the prior art of record and are in condition for allowance.

Respectfully submitted,

THE WEBB LAW FIRM

By 

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